

RESOURCE EVALUATION

"If we could first know where we are and whither we are tending, we could better judge what we do and how to do it..."
- Abraham Lincoln

SPECIAL RESOURCE STUDY CRITERIA

In order for a resource to be considered eligible for the National Park System, it must meet criteria for national significance, suitability, and feasibility. Resources must also require direct NPS management, instead of alternative protection by other public agencies or the private sector (NPS 2001).

For a resource to be *nationally significant*, it must meet the following criteria:

- It must be an outstanding example of a particular type of resource;
- It must possess exceptional value or quality in illustrating or interpreting the natural or cultural themes of our nation's heritage;
- It must offer superlative opportunities for public use and enjoyment, or for scientific study;
- It must retain a high degree of integrity as a true, accurate, and relatively unspoiled example of the resource.

The National Park System includes sites that represent major themes and facets of the nation's natural and cultural history. The determination of *suitability* for inclusion in the System requires an evaluation of how a particular type of resource is currently represented in existing units of the National Park System or in other areas managed by federal, state, or local governments and the private sector. Additionally, it must also offer superlative opportunities for public use and enjoyment, or for scientific study. If a resource type is adequately represented in existing units, or in other areas that are comparably managed for protection and public use by other entities, it is not considered suitable for addition to the National Park System.

The potential for successful management is analyzed to determine *feasibility*. Important considerations include size and configuration, land ownership, current and potential uses, acquisition costs, accessibility, threats to the resource, staffing or development requirements, and public interest in acting to protect and manage an area. An evaluation of feasibility

considers the resource in the context of natural systems and historic settings and other factors necessary to ensure the long-term protection of the area and to accommodate public use. For areas to be managed by the NPS, special attention is given to the potential for efficient administration at reasonable cost.

DETERMINATION OF SIGNIFICANCE

The Loess Hills landform region is an outstanding example of terrain formed by two fundamental geological processes--wind and erosion. While loess is a common and widespread geologic deposit, its development in western Iowa is of such magnitude that it dominates the form and substance of the landscape. The Loess Hills are the only place in the country where loess actually *constitutes* an extensive landscape of unique topography and hill forms. The extreme thickness of the loess layers and the intricately carved terrain of the Loess Hills make them a rare physiographic and geologic feature not found anywhere else in the United States.

Ecologically, the Loess Hills support a number of unique communities and include large tracts of prairie remnants. Unique plant associations in the study area are a function of the terrain and the loess. The coarse silt and the steeply sloping terrain both favor rapid drainage of water and promote the locally dry (xeric) environments that favor drought tolerant species. The prairie plant communities contain a mixture of species from the eastern tallgrass prairie and from the Great Plains mixed-grass prairies. It is this blend of east and west that sets the prairies in the Loess Hills apart from other native prairies.

From a research and educational perspective, opportunities to study past environmental conditions are plentiful. Because loess was deposited by Ice-Age winds, it constitutes a record of climates. The concretions of calcium carbonate, formed in the loess by percolating groundwater, potentially preserve a geochemical record of paleoclimatic change in continental environments. The loss of soil and the susceptibility of loess to gully erosion have prompted investigations into landscape processes and preservation strategies. Geologists frequently visit the scientifically significant exposure of Loveland Loess at its geological type section in the central Loess Hills. This particular exposure is the standard used by geologists to define the characteristics of the Loveland Loess formation, the most widespread pre-Wisconsinan loess in the mid-continent.

In 1986, portions of the Loess Hills (10,000) acres were designated as a National Natural Landmark (NNL) in recognition of the area's nationally significant loess deposits (the Loess Hills NNL consists of two separate tracts, the Turin site and the Little Sioux site) (Figure 1). The NNL program was established by the Secretary of Interior to identify, recognize, and encourage the protection of sites containing the best remaining examples of ecological and geological components of the nation's natural heritage.

Summary of Significance

The National Park Service has determined that the Loess Hills landform region is nationally significant as a topographic and geological combination not found elsewhere in the United States. The Loess Hills remain an outstanding example of a unique topographic form. The landform region possesses exceptional value in illustrating loess deposits, and the plant and animal communities that are supported by such material in a unique topographic setting. The landform region supports an exceptionally diverse array of biological communities, including significant remnant prairies. The landform and ecological communities retain a high degree of integrity as a true, accurate, and relatively unspoiled example of loess deposits, topography, and mixed grass prairie communities. Opportunities for scientific study are plentiful, particularly in the fields of ecology, geology, geomorphology, and archeology. The current infrastructure includes the National Scenic Byway and numerous publicly owned parks, preserves, and wildlife areas, thus offering numerous opportunities for public enjoyment.

Possible Further Significance

There are two properties in the Loess Hills landform region that may meet the criteria for National Historic Landmark designation. If, upon further study, these were found to meet the criteria for NHL designation, they would add to the national significance of the Loess Hills study area. The two sites are:

Glenwood Locality: Located in Mills County (Figure 5), this area contains a rich and diverse prehistoric archeological record that spans the last 12,000-13,000 years. Ninety percent of Nebraska Phase (a.k.a. Glenwood Culture) sites within the State of Iowa are located in the Loess Hills landform region; ninety-three percent of the Nebraska Phase sites within the Hills are clustered in the Pony and Keg Creek drainage near Glenwood in Mills County. Because the archeological record of this culture is largely confined to a relatively small segment of the landform region, the Glenwood Locality may qualify for NHL designation under Criterion D, properties that have yielded or may be likely to yield information important in prehistory or history. Further study is recommended.

The Jones Creek Watershed: Located in Monona County, the Jones Creek Watershed is a system of spillways and small impoundments erected by the Soil Conservation Service (SCS) between 1937 and 1942. In the mid-1930s, a group of engineers challenged the established practice of building large and hugely expensive dams at key points along major rivers, proposing that the erection of “little dams” along streams feeding those major waterways would be less costly and equally effective. The Jones Creek Watershed was one of a handful of projects selected by the Soil Conservation Service (SCS) to test this hypothesis. The undertaking successfully slowed the flow of water and captured silt, thus protecting farmlands in the Jones Creek drainage area and also downstream. The success of the Jones Creek project encouraged the SCS to continue the construction of little dams nationwide. The project’s pivotal role in resolving the “big dam vs. little dam” controversy may render it eligible for National Historic Landmark status under Criterion A, properties associated with events that have made a significant contribution to the broad patterns of our history. Further study is recommended.

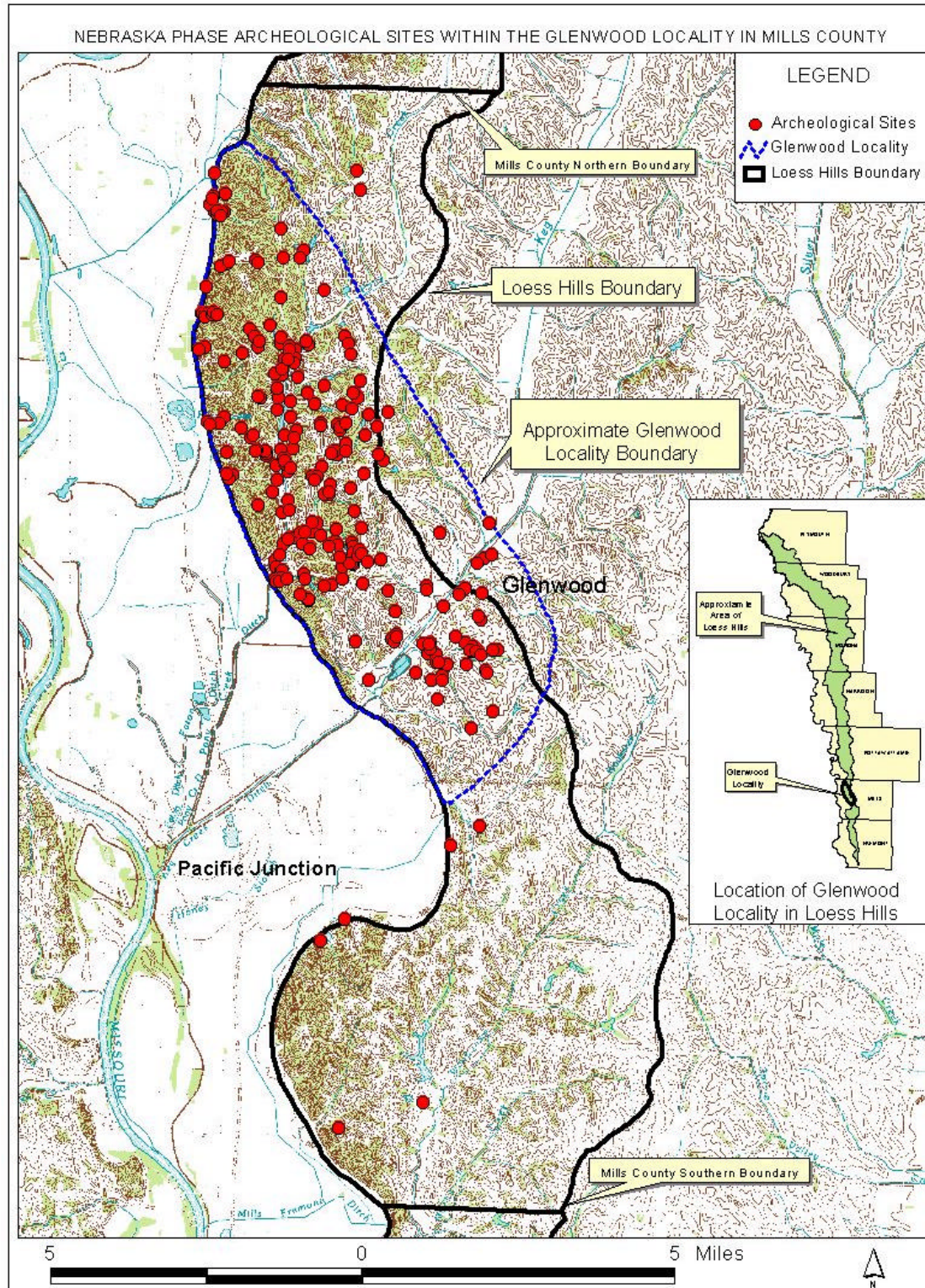


Figure 5: Glenwood Locality

There are up to 12 landscape areas in the Loess Hills landform region that may meet the criteria for National Natural Landmark Designation. Any or all of these 12 Special Landscape Areas identified by this study (Appendix D, Figure 6) may meet the criteria for National Natural Landmark (NNL) designation, as described below:

12 Special Landscape Areas: Portions of two of the Special Landscapes have already received such designation as a result of studies performed in the early 1980s (Szymkowicz and Ruhe 1981; Ruhe et al 1983). Neither of the 1980s studies leading to the designation of the two current NNLs was comprehensive with respect to the Iowa Loess Hills region. The first study was a broad survey for potential NNL sites having geologic themes within the nine-state Western Central Lowlands region; the second consisted of a brief field examination of already-known sites in the Monona-Harrison County region. Thus, although the current NNL sites do indeed display exemplary natural features of national significance, such features are not necessarily limited to these two sites. The current study identified similar features throughout the Loess Hills landform region, and these similar features were the basis for outlining the 12 Special Landscape Areas. Further study is recommended to determine the significance of these 12 special landscapes and their suitability/feasibility potential as NNLs.

DETERMINATION OF SUITABILITY

In comparing potential new additions with similar areas currently in the system, the National Park Service uses the thematic framework outlined in *Natural History in the National Park System and on the National Registry of Natural Landmarks* (1990) and *History and Prehistory in the National Park System and the National Landmarks Program* (1987). An area will be considered suitable for addition to the National Park System if it represents a natural and/or cultural type that is not already adequately represented in the National Park System, or is not comparably represented and protected for public enjoyment by other federal agencies; tribal, state, or local governments; or the private sector (National Park Service 2001).

Comparative Resource Analysis

The Loess Hills landform region is the only area in the nation that contains a combination of deep loess deposits formed and sculpted by wind and water, and important archeological, geological, historical, natural, and scenic resources and themes. The 640,000-acre Loess Hills landform region, with its loess topography, extensive prairies, rich cultural history, and numerous recreational resources, comprises a resource type that is not currently represented in the National Park System.

Loess Hills archeology, particularly the Glenwood locality, hints at the special relationships between humans and natural resources at different times in the past. American Indians have lived in, hunted in, farmed in, and traveled throughout the landform region for thousands of years. In the historic period, the Loess Hills were home to tribes that were indigenous to the region. French fur traders and missionaries discovered the Loess Hills in the early 1700s and several historically important routes crossed through and paralleled the Loess Hills landform region, including the paths taken by Lewis and Clark in 1804 and the Mormons. Nineteenth-century farmstead development and conservation projects such as the Jones Creek watershed project reflected a functional response to the terrain and its suitability for agriculture. Among the (National Park Service) themes represented here are peopling America, developing the American economy, transforming the environment, and the changing role of the United States in the world community.

In comparing just the geologic resource themes, Indiana Dunes, Pictured Rocks, and Sleeping Bear Dunes National Lakeshores, and Chickasaw National Recreational Area are other National Park System units in the same physiographic region (Central Lowlands) (NPS 1990) that also feature eolian and erosional geologic processes. Pictured Rocks National Lakeshore, located along the southern shore of Lake Superior, preserves a 40-mile stretch of sandstone bedrock cliffs. These mineral-stained outcroppings are composed of layered sedimentary rock that was originally deposited in ancient marine environments over 550 million years ago (Cambrian and late-PreCambrian age). The picturesque ramparts seen today were shaped by the relentless erosive action of waves and ice against the ancient sandstone bedrock following the last glacial retreat (about 10,000 years ago). Northern hardwood forests dominate the landscape's vegetation. The only basis for comparison of the Loess Hills with Pictured Rocks is the effect of erosional processes on the landscape. The dominant erosive agent at Pictured Rocks is the massive wave action of Lake Superior against resistant bluffs of sedimentary bedrock. In contrast, the intricate erosional sculpture of the Loess Hills is dominated by stream entrenchment along a dense drainage network as well as by mass wasting, the dislodgment of material downslope by gravity. The loess deposits undergoing erosion are vastly younger (30,000 to 12,000 years old), and the loess itself is a wind-blown deposit of highly erodible, unconsolidated silt, which contrasts sharply with the ancient, resistant sedimentary bedrock composition of Pictured Rocks.

Sleeping Bear Dunes National Lakeshore in Michigan is located along the shoreline of northeastern Lake Michigan, and Indiana Dunes National Lakeshore in northern Indiana is located along the southern-most margins of Lake Michigan. Abundant sand of glacial and beach origin along the coast and a prevailing westerly wind combined to form the dunes, beginning as the glacial period drew to a close there, about 8,000 years ago. The bulk of the dune field formed less than 3,000 years ago. This geological process continues today, as portions of the dunes are actively migrating, pushed by the wind. Sleeping Bear and Indiana Dunes are similar to the Loess Hills in that the geologic materials that compose them are derived from eolian or wind-borne processes. Also the loess in the Loess Hills and the sand at the Sleeping Bear Dunes are both by-products of glacial age (Pleistocene) activity. While the geologic agent of deposition is the same (wind), sand grains are more coarse and mobile than silt, and they produce a very different combination of topographic features. Dunes are constructional topographic features; there is little erosion involved in their shapes. The Loess

Hills are not dune forms heaped up by the wind. They are stabilized, fine-grained silt deposits that have been intricately carved by subsequent stream entrenchment, rill erosion, and mass-wasting processes into distinctly different topographic forms. The source of sand at Sleeping Bear Dunes and Indiana Dunes is tied to changing lake levels, beach and shoreline processes in adjacent Lake Michigan. The source of the silty loess in western Iowa is primarily from the adjacent Missouri River, which transported large volumes of pulverized glacial debris (“rock flour”) in major meltwater floods.

Chickasaw National Recreational Area in Oklahoma is a scenic oasis of hydrologic and bedrock-dominated topographic features, combined with numerous recreational opportunities. Again, the solid sedimentary bedrock (Ordovician age) is much older geologic material and is dominated by limestone rather than sandstone. Mineral springs, travertine deposits, streams, and lakes emphasize hydrologic features of the landscape. Extensive faults and folds extend through the area and were caused by uplift of the nearby Arbuckle Mountains during Permian time. In contrast, the Loess Hills, because of their high relief and porosity, have very low water tables, no surface or subsurface hydrologic features, and indeed contain unusual desert-like ecological niches. The unconsolidated, glacial-age, wind-deposited silt of the Loess Hills offers a sharp contrast to the Chickasaw Area in terms of geologic age, material, and origin. The comparatively youthful Loess Hills are composed of wind-deposited silt particles swept from the broad expanse of the adjoining Missouri River valley primarily between 30,000 and 12,000 years ago (Quaternary/Pleistocene age). As deposition of this massive blanket of quartz silt ceased, erosion by water and mass wasting took over and the loess was sculpted into a unique array of intricately dissected hills.

While there are other areas of significant concentrations of loess in the United States, both within and outside of the Central Lowlands physiographic region, stark differences exist. The Vicksburg, Mississippi region (including Natchez Trace Parkway) is similar in topography; however, the loess is present in a significantly smaller area and the loess deposits are not nearly as deep. Additionally, forests dominate the landscape. In the Palouse District of eastern Washington, the loess is thick and widespread; however, the landscape is defined by smoothly rolling hills that lack the intricate dissected forms characteristic of the Loess Hills. Crowley’s Ridge, located in Arkansas, contains a loess sequence that is not as thick and does not have the same topography as the Loess Hills. The ridge is largely a Tertiary alluvial remnant in the Mississippi Valley. Extensive areas of thick loess also occur in central and southern Nebraska, but do not have the same topographic development as in western Iowa. Although similar topography does occur in a very narrow band along the south side of the Platte River valley, it is not as wide or extensive as the Loess Hills (Dr. Bettis, personal communication).

Public Use Opportunities

Numerous opportunities for public enjoyment are present in the Loess Hills. There are over 50 outdoor recreation areas, including three state parks and two state forests, on over 30,000 acres of land in the Loess Hills landform region (Table 5). While most of these areas are open to the public, they are managed by a different agencies or entities, and were thus established for differing purposes. The majority of sites noted in Table 5 are less than 150 acres in size, only a handful exceed 2,000 acres and offer trails, exhibits, and other

educational opportunities. Designation of the Loess Hills as a unit of the National Park System would greatly expand the opportunities for interpretation, education and scientific study and provide a coordinated approach to understanding this unique landform.

Summary of Suitability

The National Park Service has determined that the Loess Hills are suitable for inclusion into the National Park System. The Loess Hills represents a resource type that is not already adequately represented in the national park system. Although there are a number of geologic landforms developed by wind deposition and wind/water erosion already represented in the System, none represent the sum of nationally significant resources and themes of the Loess Hills of Iowa. It is the entire 640,000-acre region of deep loess deposits, formed and sculpted by wind and water into a distinctive landscape of steep bluffs, sharp ridge crests, and intricate side-spurs that sets the Loess Hills landform region apart. The area's rich archeological and historical resources, combined with the extensive prairie ecosystems, contribute to the landform region's exceptional value. Likewise, while there are existing visitor-use opportunities in the Loess Hills, they are limited. Inclusion into the National Park System would expand existing opportunities for interpretation and education of this type of resource.

DETERMINATION OF FEASIBILITY

To be feasible as a new unit of the National Park System, an area must be of sufficient size and appropriate configuration to ensure sustainable resource protection and visitor enjoyment and it must be capable of efficient administration by the NPS at a reasonable cost. Ample territory for the preservation, interpretation, and administration of the area's natural, historical, and scenic values is an important feasibility factor. Feasibility factors are presented and discussed below.

Size and Configuration

An acceptable boundary for an envisioned unit of the National Park System should provide for the inclusion and protection of the primary resources; sufficient surrounding area to provide a proper setting for the resource or to interrelate a group of resources; and sufficient land for appropriate use and development. The Loess Hills are an elongated topographic region extending 200 miles through seven counties of western Iowa. The region includes approximately 640,000 acres, of which approximately 26,600 acres (four percent) are in public ownership and permanently protected (Figure 3). The largest publicly owned tract, Loess Hills State Forest, is 7,800 acres. The Nature Conservancy, a non-profit conservation organization, has fee ownership of nearly 3,000 acres and retains conservation easements on approximately 1,900 acres in the Loess Hills (Hickey, personal communication). Nearly 95 percent of the Loess Hills are in private ownership (ownership of the remaining one percent is unknown). Large, contiguous tracts of land in public ownership are absent. Rather, land ownership is in a "checker-board" pattern that includes a mix of state and county governments and private entities.

Land Use and Land Acquisition

Grassland or row crops cover 86 percent of the landform region. These land covers are greatest in the drier, northern counties, while woody plant coverage increases as one proceeds south, and is greatest in Fremont County. As of 1997 (Iowa State University Extension 1999), there were 965 active farms in the Loess Hills, with the majority located in Plymouth, Woodbury and Pottawattamie counties. The average farm size in the seven counties of the study is 448 acres. Nearly one-quarter of individual earnings are derived from farming in Monona, Harrison, and Fremont counties (Table 4).

Land values within the study area have steadily increased since the mid-1980s. Appreciation in land values within six of the seven counties of the study area has outpaced the growth in land values in the state of Iowa (five factors impacted land values during 1999: government program payments, interest rates, crop yields, the supply of land available, and demand by investors). In 1999, the average cost per acre of farmland ranged between \$1,469 (Monona County) and \$2,017 per acre (Plymouth County). The average cost per acre of farmland in the seven county region was \$1,633, which is slightly less than the average cost per acre (\$1,785) of farmland in the state of Iowa (Iowa State University 2000).

A land protection plan would require the identification of willing sellers and of desired parcels prioritized by resource sensitivity and threats for the roughly 640,000-acre landform region. Contiguous tracts that do not fragment sensitive resources would be desirable in order to offer the greatest amount of protection. Large contiguous tracts are also important for practical management, such as the use of prescribed fires to restore native prairies. Prioritized areas would need to be integrated with the existing conservation programs that are currently being carried out by state and local organizations in the areas. Involved entities include the seven County Conservation Boards; GHRC&D; IDNR; Soil and Water Conservation Districts; NRCS; The Nature Conservancy; Iowa Natural Heritage Foundation; Loess Hills Preservation Society; and the Western Iowa Tourism Region.

Existing Impacts and Threats to the Resource

Multiple impacts and threats to the integrity of the Loess Hills exist and include erosion, quarrying, displacement of prairie (fire suppression, invasion of exotic plant species, woody plant encroachment), overgrazing, proliferation of telecommunications towers in scenic viewsheds, and degradation of archeological resources. Ironically, human efforts to stem the effects of natural erosion, usually for agricultural purposes (terracing, water impoundment dams, etc.), have taken a substantial toll on the archeological record of the Loess Hills. Unplanned growth continues to occur, especially near Sioux City, Council Bluffs, and Glenwood, which adds to archeological resource protection issues.

Under normal circumstances, the well-drained, steep-sloped loess is strong, cohesive, and stable. However, when saturated or under the weight of structures and fill dirt, loess can collapse. Although slumping is a natural tendency in the Hills, today, the frequency of slope failure has increased in response to increased water infiltration and weight associated with a variety of human activities. Construction and changes in drainage patterns often destroy the fragile stability of this area. As a result, buildings are damaged or destroyed; entire bluff faces fail, often covering structures and roads at their base, posing a safety hazard and

highway engineering expense. This is particularly a problem in areas where the high bluff tops provide scenic vistas. Despite their propensity to collapse, these areas are desirable home sites. Slope failure and landslide hazards are serious environmental and management problems.

Gully formation, another natural processes in the Loess Hills, has become a severe problem



Photo courtesy of Loess Hills Alliance

along drainage ways. In some areas, gullies can be many miles long, more than 100 feet wide, and nearly 80 feet deep. As gullies widen, bridges and roads give way, restricting farmers' access to their fields, and escalating highway maintenance costs. This slumping of road segments and bridge foundations gives the appearance of gullies actually "swallowing" up the countryside. Indeed, the term "hungry canyons" is often used to describe the landscape in the region.

Erosion of loess by flowing water is another natural process that has been intensified through human use. The Loess Hills has one of the highest erosion rates in the U.S., almost 40 tons per acre per year (USGS 1999) which is three to four times greater than the state average of nine to ten tons per acre per year (Mutel 1989a). Although the Loess Hills are inherently susceptible to severe erosion because the steep slopes, high runoff rates, and fine-grained silt, removal of the protective vegetative cover in

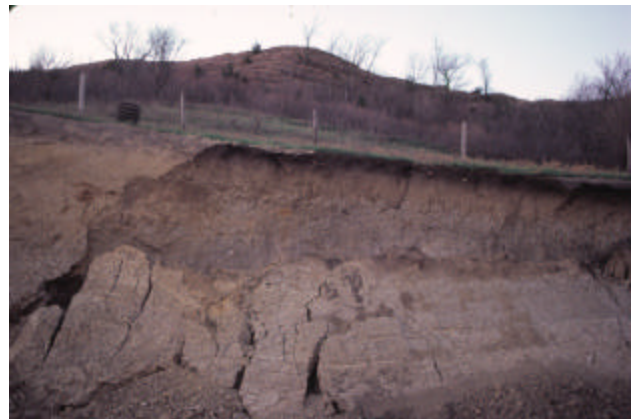


Photo courtesy of Don Poggensee

many areas has increased erosion rates. Stream sediment loads, boosted by the slumping of gully walls into streams, block ditches and impact important breeding and feeding habitats for many aquatic organisms. Trails located on steep slopes are highly susceptible to erosion. Poorly planned, constructed, and maintained trails are contributing to erosion problems in this area.

Extractive activities for earth materials are among the major threats to the Loess Hills. During the public input process, this was the most often cited concern. These activities not only visually scar the landscape, they fragment the landforms and accelerate the natural erosion process. Borrow pits for fill-dirt and road construction, quarrying of limestone bedrock, brick and tile pits, and sand and gravel pits fall into this category.



Photo courtesy of Don Poggensee

Quarrying operations date back to the 1880s when bricks were produced from small clay and shale pits in the Sioux City area. After a period of decline, extraction activities accelerated and have steadily increased during the last few decades. Aerial photographs from the 1960s indicate that mining of the western face of the Loess Hills in the area between Council Bluffs and Sioux City has accelerated. The full extent and impact of loess extraction are difficult to quantify because Iowa statute and regulation does not consider loess a

mineral. Nor are all quarries and pits required to be licensed, hence, the number of these operations and amount of material removed on an annual basis is unknown. However, there are currently 27 active state-licensed operations that extract sand, gravel, limestone or aglime in the Loess Hills and 25-licensed facilities that are "closed" or inactive. Hence, over 50 licensed operations are known to have extracted materials in the Loess Hills. Most units of local government do not have ordinances that are designed to protect the loess deposits. Plymouth County, however, is working to modify its zoning ordinances to reflect protections for the Hills set forth in a recently adopted new comprehensive plan.

Invasive shrubs and exotic plants are invading throughout the Loess Hills, particularly where overgrazing has occurred and natural fires have been suppressed. Native woodland edge species are expanding into prairies at a rapid rate, and many other areas have been converted to pastures or cultivated fields. Woodlands now cover much of the Loess Hills that was previously covered by tallgrass prairie, particularly the southern Loess Hills and the sheltered north and east-facing slopes. Prairies located in the drier far-northern Loess Hills and on south-and west-facing slopes remain relatively intact. A 1982 study of aerial photographs by Heineman concluded that in centrally located Monona County, between 1940 and 1980, canopy coverage of woody species on bluffs had increased approximately 40 percent with the greatest change occurring on the lower slopes (Heineman 1982). Currently, native prairie composes three percent of the study area, whereas historically, native prairies were the dominant plant community.

Agricultural production activities are also increasing as landowners struggle to maximize profits on their land. Newly constructed terraces and more intensive grazing are becoming increasingly common in formerly steep natural areas (U.S. Department of Agriculture 1995). Areas that have been overgrazed contribute to soil compaction, reduction of native species diversity, increased presence of exotic species, and erosion.

Archeological resources in the Loess Hills face a large number of on-going threats to their integrity. Once destroyed, archeological sites and their potential contribution to scientific understanding cannot be replaced. The same natural forces that have shaped and continue to shape the Loess Hills also pose long-term threats to archeological sites in the Loess Hills. Quarrying is considered a serious threat to the archeological resources within the study area.

Although quarrying activities have resulted in the discovery of sites such as Turin and the Siouxland Sand and Gravel sites, many sites have been lost without benefit of scientific investigations. Small impoundment dams planned by the Soil Conservation Service (now the Natural Resources Conservation Service) in the Pony Creek valley in Mills County have resulted in the destruction of archeological sites (Brown 1967; Anderson 1983). Widespread agricultural practices such as grazing and cultivation also destroy archeological sites at an alarming rate, as well as modern developments such as construction of buildings, roads, and subdivisions. Expansion of communities, particularly Council Bluffs, Sioux City, Glenwood, and the larger Loess Hills communities, also consumes archeological sites. Damage to archeological sites may also result from severe erosion and gully formation.

Increased population and development in the Loess Hills have caused an increased demand for rock quarries, sanitary landfills, housing, roads and road improvements, waste treatment facilities and fill-dirt. Each of these activities affects the integrity and diversity of the scenic resources present.

Poorly planned residential developments, telecommunications towers, agricultural activities, and quarry operations visually intrude upon the landscape. Entire bluffs have been removed for construction fill, and quarry operations have cut into hillsides, both creating extensive areas of slope failure. A proliferation of housing developments along the tops of ridges continues to accelerate erosion. Road widening, surface paving, and other road improvements can impact the scenic character and alter the historic quality of the region. All of these activities place visual scars on the landscape, impair scenic vistas, and disrupt the continuity of cultural and natural landscapes.

Social and Economic Impact

Overall, the counties of the study area have a comparatively diverse economy. Manufacturing is the leading economic sector in Fremont and Plymouth counties, whereas the service industry leads in Monona, Pottawattamie, and Woodbury counties. The government sector accounts for more than one-third of total earnings in Mills County. The increased tourism that may result from federal designation of the study area could bolster the local economy; however, associated costs to local and county infrastructures to support the increased traffic may counter-balance this effect. In counties where the farming sector is a significant amount source of individual revenue, the conversion of farmlands to public ownership could have a significant impact.

Access

Access to the study area is readily available by a number of major interstate Highways (I-29, I-80, I-680) and regional airports (Sioux City, Iowa; Omaha, Nebraska), the Loess Hills National Scenic Byway, and numerous state and county roads.

Public Interest and Support

Numerous public workshops were held during the year 2000 to gather public input (Appendix E). While there is general interest and support for the preservation of the Loess Hills, many residents in the study area are concerned about the protection of their private

property rights, the potential for property values to decline, and were opposed to acquisition of land by the National Park Service. However, there is strong consensus among both landowners (own one acre or more) and the general public that not enough is being done to protect and preserve the Loess Hills. Viewpoints vary as to how to best achieve this goal. Many residents felt that current regulations do not have enough "teeth". A telephone survey (Central Surveys Inc. 2000) sponsored by the Loess Hills Alliance found that there is strong consensus among Loess Hills households that "protection of the landform can be achieved through partnerships of private landowners and private conservation groups and that the necessary level of cooperation can be achieved without government acquisition of land". While many residents favored federal land acquisition for the purpose of establishing a national park (a proposal that was rejected by most landowners), the survey also found that acquisition of land from willing sellers by the state or by private partnership groups was acceptable. Through public meetings and mail-in comments, residents in Monona County strongly advocated protection of the rights of private property owners and did not favor government ownership of land. The telephone survey results reflected these sentiments (Central Survey 2000). The survey found that the "strongest opposition to land acquisition by the National Park Service is in Monona County." The majority of landowners were opposed to the purchase of land in the region by the federal government. The results of the survey and public comments are explained in more detail in Appendix E.

Summary of Feasibility

The National Park Service has determined that the Loess Hills landform region is not a feasible addition to the National Park System. The multiple jurisdictions and extent of private property (613,400 acres or approximately 95 percent) would make it difficult for the National Park Service to effectively and efficiently manage the area. The diversity and extent of resource threats further complicate the ability of the NPS to successfully manage the region as a single unit. The primary resource threats include residential developments, quarrying, and erosion. These issues are handled by local planning boards who have the legal authority to develop appropriate zoning ordinances, grant permits, conduct design reviews, and participate in other local planning efforts. A federal land acquisition program would not be practicable for the entire landform region, even if willing sellers came forward. The average cost per acre of farmland in the seven counties in and adjacent to the region is \$1,633 (Iowa State University 2000); there is approximately 613,400 acres in the Loess Hills landform region that is not currently permanently protected. Finally, public support for federal ownership of land among some population sectors and in some regions of the study area is absent.

Conclusion

Although the Loess Hills landform region is nationally significant, and is suitable for inclusion to the System, the entire area (640,000 acres) is not a feasible addition to the National Park System.

Those who live in the study area are interested in defining a balance that will preserve the integrity and character of the Loess Hills, promote economic development, and allow for

carefully managed use. A range of viable management alternatives for the long-term preservation of the Loess Hills is presented in the next section.